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# CATERPILLARS ON OAKS

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The live-oaks about the Bay region of California are subject from time to time to the attack of immense swarms of caterpillars, which often entirely defoliate them, thus rendering them temporarily unsightly and contributing in no small measure to the death of the trees. These losses can be entirely avoided, however, if the proper measures are taken, and this circular is prepared to call attention to the methods of accomplishing this work.

There are two species concerned, which have quite different habits and present a somewhat different problem of control.

### 1. CALIFORNIA OAK CATERPILLAR.

(*Phryganidia californica*, Pack.)

The insect bearing the above scientific name might be called the "California oak caterpillar," since it is strictly limited, as far as known, to this tree. It is a remarkable moth in many ways; it is not found outside of California, and is the only representative of its family in America. The moth is pale gray in color with an expanse of wings of about an inch, and can be seen sometimes in countless numbers flying about oak trees, especially in the latter part of the day. They are not strong of wing, but simply flutter about, alighting now and then on leaves and then again taking to wing. During the night and the larger part of the day most of the individuals will be found resting quietly on the leaves. The length of life in this stage of its existence is somewhere in the neighborhood of two weeks, during which time it may lay two or three masses of eggs, or sometimes deposit all of its eggs in one place. The under sides of the leaves are usually chosen for egg laying. The eggs are about the size of a radish seed, yellow in color at first but become darker as they develop, and finally the caterpillar emerges and begins to feed upon the foliage. The first

feeding is usually on the under side of the leaves and is noticeable on the upper side only as pale spots due to the drying out of the leaf over the denuded portion beneath caused by their feeding. Later, however, when the caterpillars get larger, the leaf is eaten through except along the larger veins, and thus becomes skeletonized. The leaves so eaten usually soon drop from the tree, which thus becomes entirely devoid of foliage. This may sometimes occur before the larger part of the caterpillars have finished feeding, and they may die of starvation. Usually, however, a good proportion of them find enough to bring them to maturity. They then seek a suitable spot on the bark of the tree and transform into a chrysalis, which is more like that of a butterfly than the form common in moths, and is entirely naked, not being protected by silken coverings. This chrysalis is strikingly ornamented with black marks and is really a very beautiful object. After a short time in this stage the adult moth emerges, thus completing the cycle.

The remedy for this insect is to spray the trees with paris green, using a mixture of one pound of paris green to two hundred gallons of water. When the moths are seen fluttering about the tree in great numbers immediate arrangements should be made for spraying the trees, and strict watch maintained so as to recognize the first signs of injury by the young worms produced from this brood of moths. As soon as these worms are noticed the application should be made at once and with great thoroughness, so as to place some of the poison in reach of every caterpillar. If this is done the insects will be killed before serious injury is occasioned and a single application will control the difficulty. This has been demonstrated many times in many places, so that there is no doubt of the efficiency of the treatment. In most cases in the past, however, the mistake has been made of allowing the caterpillar to become large, so that considerable damage is done to the trees before any steps are taken toward controlling it. There should be no difficulty, however, in following the directions here given, because the presence of the moth, which everybody recognizes, indicates the approach of the injury and gives ample time for the preparations for the work.

In spraying for this insect the only difficulty met with is that dependent upon the size of the trees affected. It will usually be necessary, in order to effectively spray, to provide ladders and send the man using the nozzle into the highest parts of the tree, and to provide him with a long extension rod enabling him to reach to every part, since thorough work can be done in this way only. One should use a spray nozzle giving a fine mist, and never attempt to spray a tree with a nozzle which throws a stream, for thorough spraying cannot be accomplished in that way. All good spray nozzles are short-distance nozzles and must be placed close to the parts of the tree when they are being sprayed. Furthermore, in spraying these insects the trees should never be allowed to drip, because after the leaves have been thoroughly wetted with a fine mist any further application simply washes off the poison which has already been placed on them, and a much less satisfactory distribution of the poison results.

Thorough spraying requires, then, first, the reaching of every part of the tree; second, the use of a spray nozzle giving a fine mist; and, third, the avoidance of drip.

The University is now experimenting with the use of especially large sizes of extension rods with the hope of finding satisfactory means of handling rods that will reach the topmost parts of the tree, avoid the use of ladders, and so simplify the spraying problem; and if the experiments prove successful the matter will be reported in full in a bulletin of this Station, but there need be no failure to protect the trees if one is sufficiently interested to give the necessary labor and attention.

## 2. TENT CATERPILLARS.

### *Malacosoma*, spp.

The above name applies to a series of moths, some six in number, which are usually known by the term "tent caterpillar," because of the peculiar habit of the young caterpillar of constructing silken tents in which they live the larger part of the day, only going forth from time to time to feed upon the leaves. The six species known to occur in California are very similar in appearance and habits, though some show such a remarkable amount of variation in color and pattern of the wings of the moth, that they have received quite a number of names, and a good many varieties are recognizable.

The insects are not strictly confined to the oak; indeed most, if not all of them, are rather general feeders. In the Bay region the live-oak leaf seems to be a favorite food, so that often they are seriously troublesome on the oak and scarcely noticeable on the other trees. The moth is quite strictly a night flier and is not very commonly observed. The eggs are laid in a mass upon the small twigs, usually forming a ring around the twig, though some times occurring simply as a mass on one side of the branch. The eggs are somewhat conical, set with the small end toward the twig and all firmly cemented, so that the individual eggs are not usually easy to distinguish. These insects are not at all infrequent on orchard trees all over the State, and the egg masses are known to all orchardists who come across them in pruning in the winter. The insects are all strictly one brooded, passing the winter in the egg state. Quite early in the spring the eggs hatch and the worms produced proceed at once to a crotch, usually following down the twig and selecting the crotch where this twig joins another, and there, all working together, build a tent of silk in which they hide. This tent at first is quite small but is increased day by day and serves as ample protection for the growing worms. When the food is abundant the insects may spend the larger part of their life in this tent, living together as a large family, going out in droves and feeding together and returning again together to their tent; but when food is scarce the social instinct is gradually overcome and the insects may be found wandering all over the trees, and leaving the tree to attack other plants. In all cases when the insect is nearly full-grown this wandering habit is assumed, even though the food may be ample; and

wherever they are abundant they become very conspicuous through their habit of crawling over the ground, especially along paths and sidewalks, and even crawling up sides of buildings. Finally they spin cocoons over themselves, using the hairs that cover the body in addition to the silk which they spin, and then transform into the pupa condition, from which somewhat later the moth emerges, and after living its retiring life lays its mass of eggs and dies.

The control of this insect on smaller trees when not very abundant can often be best accomplished by searching for the tents in the crotches in the spring and the destruction of each colony. In the Eastern States a chemist's test tube brush attached to the end of a long pole is often used, by means of which the small tents can be brushed out of the tree and brought down with their contents of small worms. The use of a torch consisting of a rag tied in a ball at the end of a pole and saturated with kerosene and set on fire has been quite commonly used in California for the burning out of the tents, but is no more rapid than the brush method and endangers the life of the twigs. We would be rather inclined to use the pole pruning shears and remove the twigs entirely, rather than to use the torch method. When the insects are very abundant it will often be preferable to spray the trees in the same way as for the preceding insect. The spray method to be employed is exactly the same as for the Phryganidia, and the timing of the spray should depend upon the observation of the presence of the small tents produced by the newly hatched worms. If the spraying is attended to while the tents are still small there will be no appreciable damage to the trees, but if this matter is allowed to go on until the insects are nearly full-grown there may not be enough good accomplished in spraying to pay for the treatment.

#### CONCLUDING REMARKS.

The oak, which is our most beautiful native tree in central California, should be protected from its insect enemies. This can be done by spraying with paris green. Any kind of spray outfit will do, though on account of the large size of the trees it would be distinctly desirable to have the use of a power outfit. The maintenance of the beauty of the shade trees is a community matter and it would be wise for the Street Departments of cities to be provided with ample equipment for making such applications. In villages and country places the ordinary orchard spray outfit is already at hand and can be used. Success will depend upon the thoroughness and the proper timing of the treatments.